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FOREST RESOURCES
OF THE
PRAIRIE REGION
IN
MISSOURI



Harold L. Mitchell, Director

FOREST SURVEY RELEASE N^o 4

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FOREST RESOURCES
OF THE
PRAIRIE REGION
IN
MISSOURI
BY
THE FOREST SURVEY ORGANIZATION

at the

Central States Forest Experiment Station

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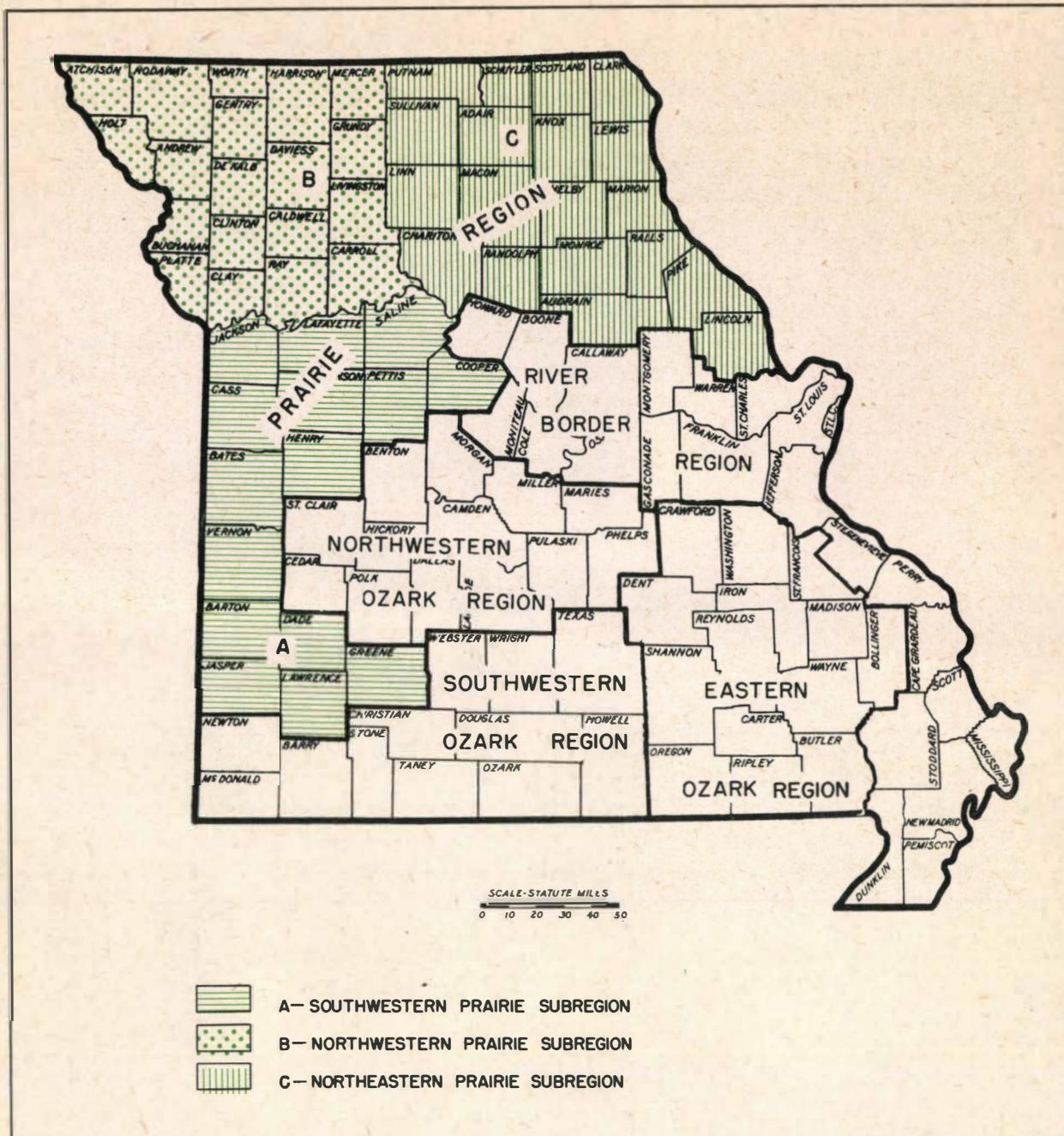
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FOREWORD

The Forest Survey is a Nation-wide activity of the Forest Service. The fivefold purpose of the Forest Survey is (1) to make a field inventory of the present supply of standing timber; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which it is being diminished through industrial and domestic uses, windfall, fire, disease, and other causes; (4) to determine the present consumption and the probable future trend in requirements for forest products; and (5) to interpret and correlate these findings with existing and anticipated economic conditions, as an aid in the formulation of both private and public policies for use of land suitable for forest production.

The Forest Survey is conducted in the various forest regions by the forest experiment stations of the Forest Service. In Missouri, the project is directed by the Central States Forest Experiment Station with headquarters in Columbus, Ohio. For Survey purposes, the State has been divided into five principal regions based on character of forest, topography, and other factors that influence tree growth.

This Survey Release presents the more significant statistics on the forest area and timber volume in the Prairie region of western and northern Missouri. Similar reports have been published for the Eastern, Southwestern, and Northwestern Ozark regions, and a release for the River Border region will be issued as soon as statistical tabulations have been completed. Later, an analytical report for the entire State will be prepared, which will interpret forest area, timber volume, growth, and drain statistics in the light of existing and anticipated economic conditions. This interpretation will focus attention on the principal forest problems and will suggest possible solutions.



LOCATION OF PRAIRIE REGION IN MISSOURI

SIGNIFICANT FACTS CONCERNING THE FOREST RESOURCES

OF THE PRAIRIE REGION

The Prairie region (see map on opposite page) is predominately agricultural. The total land area is 19.6 million acres of which only 13 percent is forested. This woodland occurs principally along stream bottoms, on the rough hills adjacent to streams, and elsewhere as scattered farm woodlots. For the most part, the region is a gently rolling country made up of plateaus dissected by numerous streams.

Table 1 shows the forest and nonforest area by counties for the three major subdivisions of the region. Approximately 14 percent of the southwest prairie subregion is forested; 9 percent of the northwest prairie subregion is forested; and 15 percent of the northeast. Practically the entire forest area is privately owned.

Saw-timber stands occupy 19 percent of the forest area. This proportion is considerably higher than occurs in the Ozark portion of the State. Pole-timber stands are found on 38 percent of the forest area, and seedlings and saplings on 25 percent. Approximately 18 percent of the forest area is poorly stocked. This relatively large portion of poorly stocked land is due chiefly to heavy grazing of farm woods in a conscious effort to transform the woodland to open pasture.

The composition of the forest in the Prairie region is distinctly different from the Ozark forest. Forest types in which oak is the predominant species make up only 58 percent of the forest area in the Prairie region in contrast with 80 to 90 percent in the Ozarks. Bottomland and mixed hardwood types, on the other hand, account for 39 percent of the forest area in the Prairie region in contrast with 5 to 7 percent in the Ozarks.

The total volume of saw timber is 2.7 billion board feet. The oaks make up 44 percent of this volume. In the Ozarks they account for approximately 75 percent of the total volume. Elm, maple, and cottonwood are much more abundant in the Prairie region than in the Ozarks. Nearly one-third of the volume in the Prairie region is in trees 20" d.b.h. and larger. This proportion is nearly double that for the Ozark forests.

The total volume of pole-size trees and the sawlog portion of saw-timber trees is 876 million cubic feet. One-half of this volume is in trees less than 11 inches d.b.h.

The average volume per forest acre in the Prairie region is 107⁴ board feet. The average cubic volume including pole-size trees and sawlog portions of saw-timber trees is 351 cubic feet. The average board-foot volume is about 70 percent greater and the average cubic-foot volume 40 percent greater than the corresponding volumes for the Ozarks.

Table 1.--Forest and nonforest area by county,

Prairie region, 1947

A. SOUTHWESTERN PRAIRIE SUBREGION

County	Total land area 1/	Forest area	Nonforest area		
	Thousand acres	Thousand acres	Percent	Thousand acres	Percent
Barton	380	28	7	352	93
Bates	538	63	12	475	88
Cass	447	43	10	404	90
Cooper	360	56	16	304	84
Dade	323	65	20	258	80
Greene	433	88	20	345	80
Henry	472	75	16	397	84
Jackson	386	39	10	347	90
Jasper	411	73	18	338	82
Johnson	529	58	11	471	89
Lafayette	406	39	10	367	90
Lawrence	396	77	19	319	81
Pettis	434	55	13	379	87
Saline	486	47	10	439	90
Vernon	536	78	15	458	85
Total	6,537	884	14	5,653	86

B. NORTHWESTERN PRAIRIE SUBREGION

Andrew	275	29	11	246	89
Atchison	352	22	6	330	94
Buchanan	263	24	9	239	91
Caldwell	275	21	8	254	92
Carroll	444	33	7	411	93
Clay	264	25	9	239	91
Clinton	269	16	6	253	94
Daviess	360	31	9	329	91
DeKalb	271	19	7	252	93
Gentry	312	34	11	278	89
Grundy	278	30	11	248	89
Harrison	461	46	10	415	90
Holt	292	29	10	263	90
Livingston	341	46	13	295	87
Mercer	292	35	12	257	88
Nodaway	561	34	6	527	94
Platte	265	32	12	233	88
Ray	368	46	12	322	88
Worth	171	18	11	153	89
Total	6,114	570	9	5,544	91

Table 1.--Forest and nonforest area by county, Prairie region, 1947,
continued.

C. NORTHEASTERN PRAIRIE SUBREGION

County	Total land area 1/	Forest area	Nonforest area		
	Thousand acres	Thousand acres	Percent	Thousand acres	Percent
Adair	367	60	16	307	84
Audrain	443	30	7	413	93
Chariton	486	64	13	422	87
Clark	326	53	16	273	84
Knox	328	37	11	291	89
Lewis	323	55	17	268	83
Lincoln	403	102	25	301	75
Linn	399	29	7	370	93
Macon	521	79	15	442	85
Marion	282	57	20	225	80
Monroe	428	59	14	369	86
Pike	436	116	26	320	74
Putnam	331	49	15	282	85
Ralls	306	57	19	249	81
Randolph	310	59	19	251	81
Schuylerville	196	22	11	174	89
Scotland	282	26	9	256	91
Shelby	321	51	16	270	84
Sullivan	418	37	9	381	91
Total	6,906	1,042	15	5,864	85
Total Prairie region	19,557	2,496	13	17,061	87

1/ Source: Area of the United States 1940, U. S. Bureau of the Census.

Table 2.--Commercial forest area by ownership class, Prairie region, 1947

Ownership class	:		Commercial forest area <u>1/</u>
	<u>Thousand</u>	<u>Percent</u>	
Federal:			
National forest	0	0	
Other	0	0	
Total	0	0	
State	1	<u>2/</u>	
Private	2,489	100	
All ownerships	2,490	100	

1/ Does not include 6,000 acres of forest land classified as noncommercial.

2/ Less than .05 percent.

Table 3.--Commercial forest area by forest type
and stand-size class, Prairie region, 1947

Forest type	Total	M acres	Saw-timber area	M acres	Pole-timber area	M acres	Seedling & sapling area	M acres	Poorly stocked area
	M acres	Percent	M acres	M acres	M acres	M acres	M acres	M acres	M acres
Cedar-hdwd.	12	.5	0	6	0	0	6	6	
Oak-hickory	1,017	40.8	93	442	349	133			
White oak	275	11.1	71	167	24	13			
Mixed hdwd.	357	14.3	81	103	65	108			
Pin oak flats	141	5.7	36	39	41	25			
Bottomland hdwd.	608	24.4	199	179	122	108			
Scrub hdwd.	80	3.2	0	0	16	64			
All types	2,490		480	936	617	457			
Percent		100	19.3	37.6	24.8	18.3			

Table 4.--Saw-timber volume on commercial forest area by species
and stand-size class, Prairie region, 1947

Species	Total	Saw-timber area	Pole-timber area	Seedling & sapling area	Poorly stocked area
	Million bd. ft.	Percent	Million bd. ft.	Million bd. ft.	Million bd. ft.
Redcedar	6	.2	0	5	0
White oak	459	17.2	234	156	24
Post oak group	295	11.0	149	60	50
Black oak	182	6.8	113	51	4
Scarlet oak	30	1.2			
Northern red oak	71	2.7	142	62	26
Other red oaks	142	5.3			
Hickory	147	5.5	84	33	6
Elm	469	17.5	215	72	79
Sycamore	113	4.2	89	17	7
Sugar maple	32	1.2			
Soft maple	120	4.5	109	20	1
Cottonwood	232	8.7	200	11	16
Black walnut	159	5.9	80	35	11
Ash	53	2.0			
Other hdwds.	165	6.1	111	44	28
All species	2,675		1,526	566	252
Percent		100.0	57.0	21.2	9.4
					12.4

Table 5.--Saw-timber volume on commercial forest area by species
and tree-diameter class, Prairie region, 1947

Species	Total	Tree-diameter class			
		10 1/ inches	12-14 inches	16-18 inches	20 inches and larger
		Million bd. ft.	Million bd. ft.	Million bd. ft.	Million bd. ft.
Redcedar	6	2	4	0	0
White oak	459	--	214	135	110
Post oak group	295	--	96	105	94
Black oak	182	--	74	38	70
Other red oaks	243	--	74	88	81
Hickory	147	--	70	46	31
Elm	469	--	200	113	156
Sycamore	113	--	9	19	85
Maple	152	--	74	37	41
Cottonwood	232	--	59	66	107
Black walnut	159	--	66	68	25
Other hdwds.	218	--	105	67	46
All species	2,675	2	1,045	782	846
Percent	100	.1	39.1	29.2	31.6

1/ Ten-inch diameter class shown separately because in this class, saw-timber volume includes softwood trees but not hardwoods.

Table 6.--Cubic-foot volume on commercial forest area by species and
stand-size class, Prairie region, 1947

Species	Total	Saw-	Pole-	Seedling	Poorly
		timber	timber	& sapling	stocked
		Million cu. ft.	Million cu. ft.	Million cu. ft.	Million cu. ft.
Redcedar	5.1	.6	0	4.5	.2
White oak	160.8	18.4	51.0	96.9	5.5
Post oak group	97.2	11.1	36.7	42.1	11.2
Black oak	66.9	7.6	23.8	38.9	2.0
Scarlet oak	6.0	.7			
Northern red oak	22.9	2.6	25.7	36.3	5.6
Other red oaks	43.3	4.9			
Hickory	65.3	7.5	24.9	28.4	4.0
Elm	130.0	14.9	52.6	38.5	17.7
Sycamore	28.1	3.2	14.5	4.4	9.2
Sugar maple	14.4	1.6			
Soft maple	57.6	6.6	36.2	29.8	.4
Cottonwood	48.4	5.5	34.0	11.1	2.6
Black walnut	46.3	5.3	15.0	18.1	5.0
Ash	20.3	2.3			
Other hdwds.	63.0	7.2	27.1	31.2	9.1
All species	875.6		341.5	380.2	72.5
Percent		100.0	39.0	43.4	8.3
					9.3

Table 7.--Cubic-foot volume on commercial forest area by stand-size class and tree-diameter class, Prairie region, 1947.

Stand-size class	Total	Tree-diameter class				
		6-8 inches	10 inches	12-14 inches	16-18 inches	:20 inches and larger
		Million cu. ft.	Million cu. ft.	Million cu. ft.	Million cu. ft.	Million cu. ft.
Saw timber	341.5	55.5	40.1	76.7	73.1	96.1
Pole timber	380.2	189.3	97.0	63.7	20.3	9.9
Seedling & sap- ling	72.5	22.0	9.2	17.3	16.9	7.1
Poorly stocked	81.4	15.7	12.5	19.0	15.5	18.7
All classes	875.6	282.5	158.8	176.7	125.8	131.8
Percent	100.0	32.3	18.1	20.2	14.4	15.0

Table 8.--Average volume per acre by stand-size class, Prairie region, 1947

Stand-size class	Average volume per acre	
	<u>Board feet</u>	<u>Cubic feet</u>
Saw timber	3,179	712
Pole timber	605	406
Seedling and sapling	408	118
Poorly stocked	72 $\frac{1}{4}$	178
All classes	1,074	352

Table 9.--Total cubic-foot volume of sound wood on commercial forest
area by species and class of material, Prairie region, 1947

Species	Saw-timber trees		Pole-	Cull trees 1/
	Total	Sawlog portion	Tops and limbs 1/	
	Million cu. ft.	Million cu. ft.	Million cu. ft.	Million cu. ft.
Redcedar	5.1	2.3	1.9	0.4
White oak	236.1	125.9	72.7	53.2
Post oak group	170.5	92.5	52.7	39.8
Black oak	109.1	51.0	29.0	22.0
Other red oaks	128.2	67.3	38.5	28.8
Hickory	93.3	42.0	23.9	18.1
Elm	324.0	132.2	75.3	56.9
Sycamore	43.6	30.8	17.8	13.0
Maple	145.0	43.0	24.5	18.5
Cottonwood	85.3	64.7	37.4	27.3
Black walnut	76.4	45.3	25.8	19.5
Other hdwds.	169.0	61.3	35.1	26.2
Noncommercial species 1/	18.3	--	--	--
All species	1,603.9	758.3	434.6	323.7
Percent	100.0	47.3	27.1	20.2
				27.5
				25.2

1/ Not included in the cubic-foot volume shown in Tables 6 and 7, excepting the 0.4 million cubic feet in tops of redcedar.

EXPLANATION OF TERMS USED

Forest land - Land bearing forest growth or land from which the forest has been removed but which shows evidence of past forest occupancy and which is not now in other use. To qualify as forest, an area must: (1) be at least 100 feet wide; (2) be at least one acre in area; (3) have a sufficient number of trees to provide 10 percent crown coverage, or (4) lacking 10 percent crown coverage, be likely to remain in forest use.

Commercial forest land - Forest land bearing or capable of bearing timber of commercial character and economically available now or prospectively for commercial use and not withdrawn from such use.

Noncommercial forest land - Forest land not qualifying as commercial forest land. Two classes of forest area are included: (1) commercially valuable forest land withdrawn from timber use for such purposes as parks, game refuges, military reservations, or reservoir protection; and (2) forest land which because of poor growing conditions will not produce trees of commercial quality.

Forest types

Cedar-hardwoods - Stands in which redcedar comprises at least 20 percent of the dominant and codominant trees.

Oak-hickory - Stands of hardwoods in which oaks and hickories comprise at least 60 percent of the dominant and codominant trees.

White oak - Stands in which white oak (Quercus alba) comprises at least 60 percent of the dominant and codominant trees.

Mixed hardwoods - Stands of mixed hardwood species not qualifying for other hardwood types. Principal species include elm, maple, basswood, and black walnut in mixture with oaks and hickories.

Pin oak flats - Stands of pin oak and other hardwoods occurring on poorly drained flats. Associate species include soft maple, elm, hickory, and sweetgum.

Bottomland hardwoods - Stands on the alluvial bottoms of rivers and streams. The principal species include sycamore, willow, elm, blackgum, sweetgum, soft maple, oaks, hickory, cottonwood, and cypress.

Scrub hardwoods - Stands in which scrub oak or other noncommercial tree species comprise 60 percent of the dominant and codominant trees.

Tree classes

Sound saw-timber tree - A coniferous tree at least 9.0 inches d.b.h. (diameter outside bark at 4.5 feet above ground), or a hardwood tree at least 11.0 inches d.b.h., with a sound butt log at least 8 feet long, or with at least half of the gross volume of the tree in sound material.

Sound pole-timber tree - A tree at least 5.0 inches d.b.h. but less than saw-timber size, which now is or gives promise of becoming a sound merchantable tree.

Cull tree - A tree that does not qualify as a sound pole-timber or saw-timber tree because of poor form, limbiness, rot, or other defect.

Volume estimates

Board-foot volume - Includes the volume of that portion of saw-timber trees merchantable for sawlogs. Volume deductions have been made for rot, crook and other defects. Board-foot volumes are shown in the International 1/4-inch log rule, which approximates green lumber tally.

Cubic-foot volume - Except where specifically noted, includes the volume of sound wood inside bark in: (1) the saw-timber portion of sound trees, (2) the upper stems of saw-timber-size conifers to a minimum diameter of 4 inches inside bark, and (3) the sound pole-timber trees to the same minimum top diameter.

Stand-size class

Saw timber - Stands having a minimum net volume of 1500 board feet per acre.

Pole timber - Stands having a net volume of less than 1500 board feet per acre but which are at least 10 percent stocked with pole-size and larger trees. At least one-half the minimum stocking must be in pole-size trees.

Seedlings and saplings - Stands not qualifying either for saw timber or pole timber but having at least 300 seedlings and saplings of commercial species per acre.

Poorly stocked - Commercial forest land not qualifying for any other class, including denuded areas.

Species listed

Redcedar - Eastern redcedar - Juniperus virginiana

White oak - Quercus alba

Post oak group includes:

Post oak - Quercus stellata

Swamp white oak - Quercus bicolor

Swamp chestnut oak - Quercus prinus

Overcup oak - Quercus lyrata

Bur oak - Quercus macrocarpa

Chinquapin oak - Quercus muehlenbergii

Black oak - Quercus velutina

Scarlet oak - Quercus coccinea

Northern red oak - Quercus borealis

Other red oaks include:

Southern red oak - Quercus falcata

Pin oak - Quercus palustris

Willow oak - Quercus phellos

Water oak - Quercus nigra

Shingle oak - Quercus imbricaria

Hickory - includes all species of hickory (Carya)

Elm - includes all species of elm (Ulmus)

Sycamore - Platanus occidentalis

Sugar maple - Acer saccharophorum

Soft maple includes:

Red maple - Acer rubrum

Silver maple - Acer saccharinum

Boxelder - Acer negundo

Cottonwood - Populus deltoides

Black walnut - Juglans nigra

Ash - includes all species of ash (Fraxinus)

Other hardwoods - includes all other commercial hardwood species

Noncommercial species - includes species which do not normally have commercial value such as blackjack oak, sassafras, blue beech, ironwood, alder, redbud, and service berry.

FOREST SURVEY PROCEDURE

The inventory of the forest resources of the Prairie region was made in April, May, and June 1947. A sampling procedure was used involving an office study of aerial photographs and a field examination of randomly selected forest and nonforest plots.

The proportion of forest land by counties was obtained by placing over each photograph on alternate flight lines a transparent template with 12 uniformly spaced dots and counting the number of dots falling on forest and on nonforest areas. The percentage of forest dots in a county applied to the total land area gave a preliminary estimate of the forest acreage.

The location of every third dot falling on forest land was marked on the photograph. The acre surrounding each marked dot was examined under stereoscope and classified by stand-size class on the basis of the height, crown width, and density of trees on the plot.

Plots for field examination were selected from those photo classified as follows:

Saw timber - - - - -	1 in 5
Pole timber - - - - -	1 in 10
Seedling & sapling - - - - -	1 in 20
Foorly stocked - - - - -	1 in 10

In addition, every 50th nonforest plot was selected for field examination to measure the movement of nonforest land to forest.

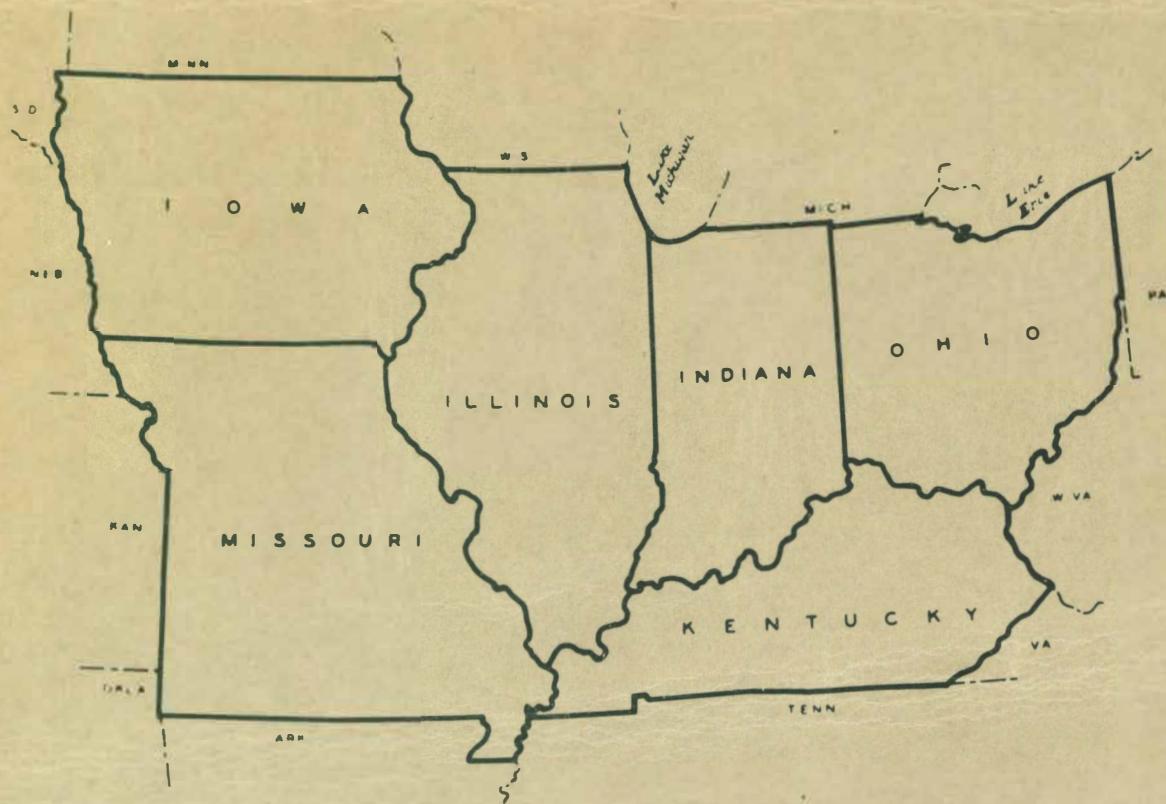
The locations of the selected plots were marked on the photographs which were then sent to the field. Crews of two men each located these points on the ground and at each established a $1/5$ -acre plot on which they recorded the species, size, condition, and growth rate of trees, and the forest type and site quality of plots. A field check of the photo interpreter's stand-size-class determination was also made. The field examination also provided a basis for adjusting the preliminary estimate of forest and nonforest area.

Approximately 95,860 dots were counted on the photos for forest area determination. Stereoscopic examinations were made on 4,346 forest plots to determine stand-size class, and 794 plots were examined on the ground. These photo and field examinations provided the basic data for computation of forest area and timber volume statistics for the region.

ACCURACY OF DATA

Forest area - Statistical analysis of the forest area data for the Prairie region shows a sampling error of \pm 1.5 percent of the total forest area or \pm 37,440 acres, at a level of one standard deviation. The error of estimate increases with each subdivision of the total forest area so that small tabular acreages may have large errors and therefore indicate only relative magnitudes.

Timber volume - The sampling error of the total board-foot volume in the region is \pm 5.6 percent or \pm 150 million board feet. This does not include the errors of volume tables, cull factors, or other phases of the inventory work for which satisfactory methods of measuring accuracy have not been developed. All phases of field work and computations were closely supervised to keep these errors at a minimum. Again the error of estimate increases with each subdivision of the total volume so that small volumes indicate only relative magnitudes.



TERRITORY SERVED
BY THE
CENTRAL STATES FOREST EXPERIMENT STATION
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UNITED STATES DEPARTMENT OF AGRICULTURE